Part No. P0989728 02

Business Communications Manager

Digital Drop & Insert (DDI) MUX Installation Guide

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Preface

This guide describes how to install and initialize the Digital Drop & Insert (DDI) MUX media bay module.

Information in this explains how to:

- install the DDI MUX
- initialize the DDI MUX

To use this guide, you must:

- be a Nortel Networks installer with Business Communications Manager accreditation
- know basic Nortel Networks terminology

Symbols used in this guide

This guide uses symbols to draw your attention to important information. The following symbols appear in this guide:

Caution: Caution Symbol
Alerts you to conditions where you can damage the equipment.

Danger: Electrical Shock Hazard Symbol
Alerts you to conditions where you can get an electrical shock.

Warning: Warning Symbol
Alerts you to conditions where you can cause the system to work improperly or to fail.

Note: Note Symbol
Alerts you to important information.

Tip: Tip Symbol
Alerts you to additional information that can help you perform a task.

Warning: Grounding Symbol.
Alerts you to ground yourself with an antistatic grounding strap before performing the maintenance procedure.

Warning: Disconnect Symbol
Alerts you to remove the Business Communications Manager base unit and Business Communications Manager expansion unit power cords from the AC outlet before performing any maintenance procedure.

Text conventions

This guide uses the following text conventions:

`bold Courier text`	Indicates command names and options and text that you need to enter in a command-line interface. Example: Use the **`dinfo`** command. Example: Enter **`show ip {alerts|routes}.`**
italic text	Indicates file and directory names, new terms, book titles, Web addresses, and variables in command syntax descriptions.
bold text	Indicates command names, screen titles, options and text for a graphical user interface (GUI).
angle brackets (< >)	Indicates a keyboard key press or simultaneous key presses, i.e. <ENTER> or <CTRL j> or when part of a command string, indicates that a variable is to be entered. Example: <IP address>, where the information to be entered at that point is the specific information for the required field, in this case, a specific IP address.

Acronyms

These are the acronyms used in this document.

BPS	Bits per second
CSU	Channel service unit
DSU	Data service unit
DTM	Digital Trunk media bay module
LAN	Local area network
MSC	Media services card
MUX	Multiplexor
WAN	Wide area network

Related publications

The following documents provide further information about the Business Communications Manager base unit and related media bay modules, extension equipment, and the applications and software on the system:

- *Business Communications Manager 2.5 Programming and Operations Guide* describes how to program the Business Communications Manager equipment.
- The *Business Communications Manager 2.5 Installation and Maintenance Guide* describes how to install and maintain a Business Communications Manager system.

How to get help

- USA and Canada

  Authorized Distributors - ITAS Technical Support

  Telephone: 1-800-4NORTEL (1-800-466-7835)

  If you already have a PIN Code, you can enter Express Routing Code (ERC) 196#

  If you do not yet have a PIN Code, or for general questions and first line support, enter ERC 338#

  Website: http://www.nortelnetworks.com/itas/

  email: naitas@nortelnetworks.com

  Presales Support (CSAN)

  Telephone: 1-800-4NORTEL (1-800-466-7835)

  Use Express Routing Code (ERC) 1063#

- EMEA (Europe, Middle East, Africa)

  Technical Support - CTAS

  Telephone: 00800 800 89009 or 33 4 9296 1341

  Fax: 33 49296 1598

  email: emeahelp@nortelnetworks.com

- CALA (Caribbean & Latin America)

  Technical Support - CTAS

  Telephone: 1-954-858-7777

  email: csrmgmt@nortelnetworks.com

- APAC (Asia Pacific)

  Technical Support - CTAS

  Telephone: +61 388664627

  Fax: +61 388664644

  email: asia_support@nortelnetworks.com

Installing the DDI MUX

The Business Communications Manager Digital Drop & Insert (DDI) MUX enables a Business Communications Manager system to share its connection to a Universal T1 network with a local area network (LAN). A DDI MUX allows you to make more efficient use of your digital network resources and reduces the amount of equipment needed to support your voice and data networks.

The DDI MUX:

- provides the functionality of a DTM media bay module (T1 digital lines only)
- splits the incoming T1 line so that some of the lines are used for voice traffic and some of the lines are used for data traffic
- provides either the CSU (Channel Service Unit) or DSU (Data Service Unit) functionality to support connections to data terminal equipment (DTE), such as a router or a bridge
- connects to network devices that support V.35 interfaces
- provides end-to-end transparent bit service
- supports loopbacks between the DDI MUX and the internal Business Communications Manager components, and between the DDI MUX and digital terminal equipment

Figure 1 Overview of network using DDI MUX with the Business Communications Manager internal router

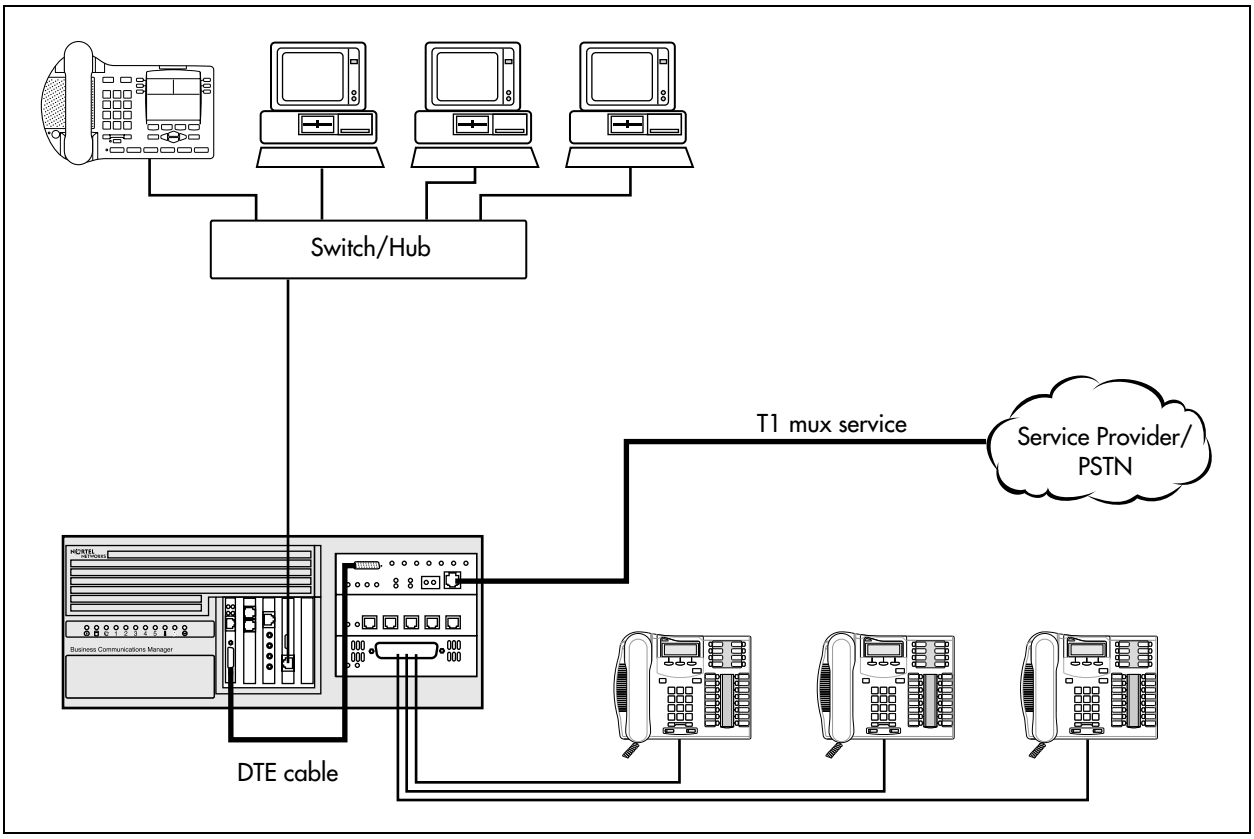
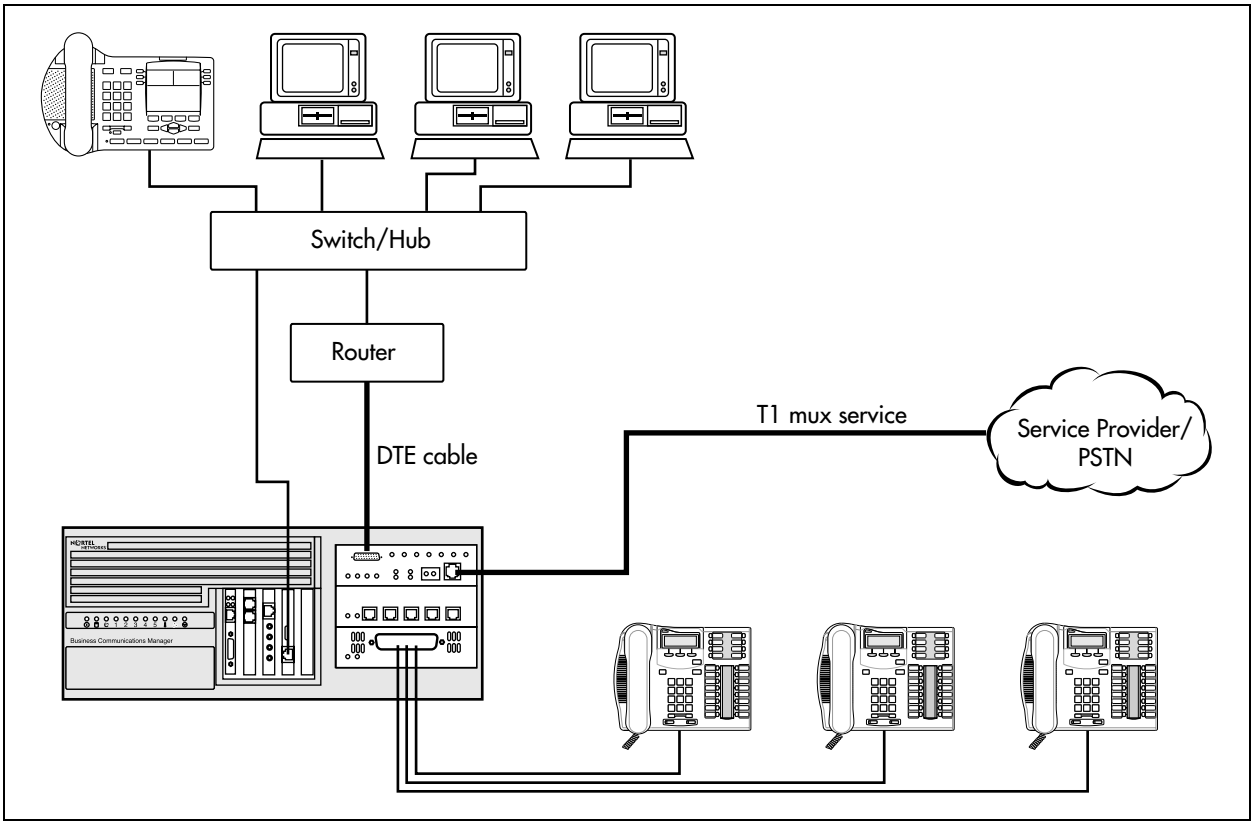


Figure 2 Overview of network using DDI MUX with an external router



Before you start

- Make sure you read and follow the instructions in this guide.
- Make sure you have the correct cable to connect to your DTE.
  The DTE cable is ordered separately so you can select the correct cable for your application.
  For more information about the DTE cables available, refer to "DTE cables" on page 23.

Business Communications Manager system requirements

- Make sure your Business Communications Manager system is using Business Communications Manager 2.5 Feature Pack 1 software or higher.
- Make sure you have an available media bay on the Business Communications Manager Base Unit.
- Make sure you have two DS30 channels available.

Setting the DIP switches

Before you install the DDI MUX, you must set the DIP switches located on the back of the media bay module. These DIP switches determine the DS30 channels assigned to the DDI MUX.

To set the DIP switches, you need to:

- determine the module switch setting you want to use
- set the DIP switches

Determining the module DIP switch settings

The DDI MUX module combines a DTM (Digital Trunk Module) and a Data Module. The switch setting you choose determines the DS30 channel assigned to the DTM portion of the DDI MUX. The Data Module is automatically assigned the next DS30 channel number.

The DS30 channel you assign to the DDI MUX determines the line numbers of the T1 line connected to the DDI MUX. Table 1 shows the switch settings for each DS30 channel, and the resulting line assignments.

Table 1 DDI MUX switch settings

DDI MUX DS30 channel	Enter these switch settings						Assigns these lines numbers	Data Module DS30 channel
	1	2	3	4	5	6		
2	on	on	on	on	on	on	211-234	3
3	on	on	on	on	on	off	181-204	4
4	on	on	on	on	off	on	151-174	5
5	on	on	on	on	off	off	121-144	6
6	on	on	on	off	on	on	91-114	7*
7								**

* If your system is configured with a 3/5 DS30 channel split, you cannot use DS30 channel 6 for the DDI MUX. When you use a 3/5 split, DS30 channel 7 is not available for the data module portion of the DDI MUX.

** You cannot use DS30 channel 7 for the DDI MUX. If you assign DS30 channel 7, there is no DS30 channel available for the data module portion of the DDI MUX.

To determine the DIP switch settings for the DDI MUX:

1 Use Table 1 to determine the DS30 channel that assigns the line numbers you want to use with the DDI MUX.

Warning: Do not use DS30 channel 7 for the DDI MUX module. If you choose DS30 channel 7, there is no DS30 channel available for the data module.

If your Business Communications Manager system is set to a 3/5 DS30 channel split, do not use DS30 channel 6 or 7.

2 Use Table 1 to determine the DIP switch settings you want to use for the DDI MUX.

The DS30 channel you choose for the DDI MUX, and next DS30 channel, can not be used by any other media bay module installed in the Business Communications Manager system. For detailed information about choosing the DS30 channels for all of the media bay modules, refer to the *Business Communications Manager Installation and Maintenance Guide*.

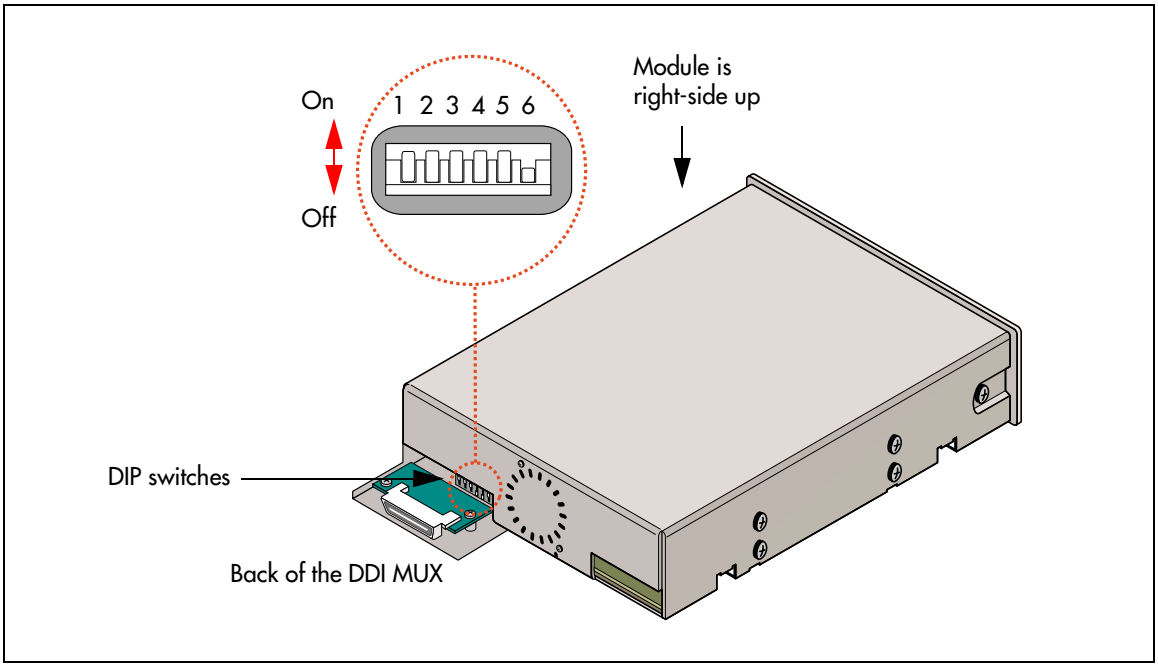
Setting the DIP switches on the DDI MUX

After you have determined the DIP switch settings for the DDI MUX, you need to set the DIP switches.

Follow these steps to set the DIP switches:

1 Locate the DIP switches on the DDI MUX.

Figure 3 Switches on the DDI MUX



2 Set the switches to correspond with the settings you chose in “Determining the module DIP switch settings” on page 15.

You are now ready to install the modules into the Business Communications Manager system.

Tip: Create a label with the DS30 channel and DIP switch settings, and stick it to the front of the module to provide ease of reference for maintenance activities.

Installing the DDI MUX in the Business Communications Manager system

Important safety instructions

The following safety instructions cover the installation and use of the DDI MUX. Read carefully and retain for the future.

Warning: To avoid electrical shock hazard to personnel or equipment damage, observe the following precautions when installing telephone equipment.

1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines. The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the DDI MUX.

Installation overview

After you set the switches on the DDI MUX, you can install it in the Business Communications Manager base unit.

Note: The DDI MUX and DTM media bay modules must be installed in the Business Communications Manager base unit. If there is no room in the base unit, move one of the other types of media bay module to the Business Communications Manager expansion unit to provide space.

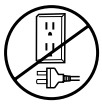
To install the DDI MUX, you need to:

- shut down the Business Communications Manager
- install the DDI MUX
- start up the Business Communications Manager

Danger: The Business Communications Manager must be correctly powered down before you install or remove media bay modules.

Shutting down the system

Before you shut down the system, read the following warnings to ensure you and your system are properly protected.



Warning: If you are installing a new system, or new base unit or expansion unit, refer to the “Installing telephones and peripherals” section of the *Business Communications Manager Installation and Maintenance Guide* for instructions about installing a new system before you connect the system to the ac power outlet.

Warning: DO NOT continue with module installation until you ensure the base unit and expansion unit are set to the correct voltages (version 2.0 systems with standard power supply).

Warning: Failure to follow procedures to properly disconnect the Business Communications Manager base unit and expansion unit, can result in module or system damage.

Warning: Ensure you are properly grounded before handling modules or any components that are part of the Business Communications Manager hardware.

This section describes the recommended procedure for shutting down the Business Communications Manager prior to installing new modules.

1 If you are adding or replacing a module in an active system, start a Unified Manager session with the Business Communications Manager and follow these steps first:

   a Choose **System**.

   b Click the **Logoff** menu and then click **Shutdown**.

   c Click the **Yes** button.

   d Wait until the Status changes to **Complete! It is safe to turn off the system**.

   e Click the **Done** button.

   f Exit Unified Manager.

Note: For information about how to use Unified Manager, refer to the *Business Communications Manager Programming Operations Guide*.

2 Attach one end of the grounding strap to your wrist and the other end to a grounded metal surface.

3 Ensure the cables connected to the front of the base unit and the expansion unit are clearly marked.

4 Unplug any telephone or network cables from all the media bay modules and the MSC on the Business Communications Manager base unit and the expansion unit.

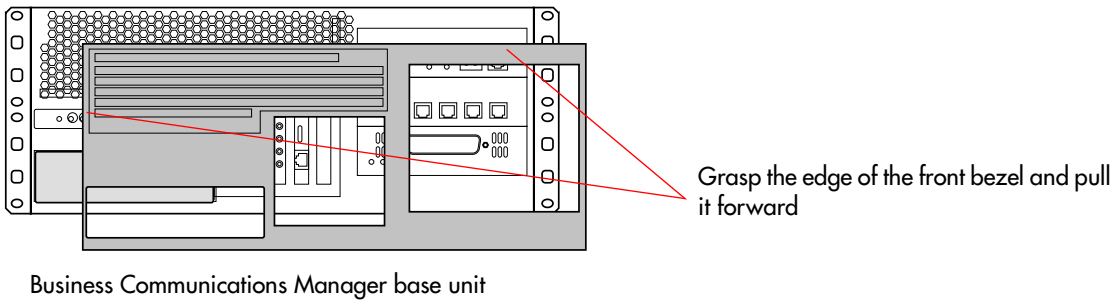
5 Disconnect the base unit and expansion unit power cords from the ac outlet.

Installing DDI MUX

After the system is powered down, you can install the DDI MUX. Follow this procedure to install the DDI MUX.

1 Remove the front bezel from the base unit. To remove the bezel, grasp the edges and pull the bezel forward. Refer to Figure 4.

Figure 4 Removing the front bezel

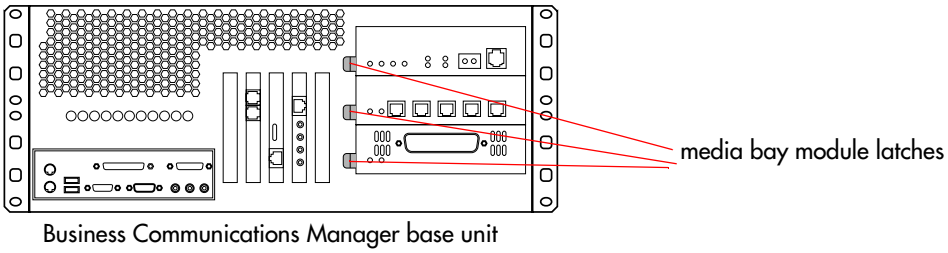


2 Select an open media bay.

Note: If there is no open media bay, select a media bay module to move to the Business Communications Manager expansion unit. Do not move a DTM to the expansion unit.

3 Pull the latch beside the selected bay to release the media bay bezel. Refer to Figure 5.

Figure 5 Identifying the media bay module latches



4 With the face of the module towards yourself, insert the media bay module into the open bay, ensuring that the sides of the module are parallel with the sides of the bay.

5 Gently push the media bay module straight back into the unit.

Warning: Insert the DDI MUX carefully and squarely into the housing to ensure that the power connector on the module correctly and securely connects to the backplane of the media bay.

You will hear a click when the module is firmly seated in the media bay. The module sits slightly forward from the face of the Business Communications Manager. When the front bezel is replaced, the module face is flush with the surface of the unit.

6 Replace the front bezel on the base unit.

Starting up the system

After you install the module correctly into the bay, you must return the equipment to operation in an orderly way.

Follow these steps carefully to ensure that you return your system to operation without endangering the equipment or yourself.

1 Plug the power cords for the Business Communications Manager base unit and the expansion unit back into the ac outlets.

Note: The Business Communications Manager system starts up when you connect the ac power cord. System startup takes several minutes to complete.

2 Connect the telephone and network cables to the proper outlets on the media bay modules and the MSC.

3 Check that the LEDs on the modules are on and static. Refer to “Installation troubleshooting” on page 34 for a detailed description of the LED states.

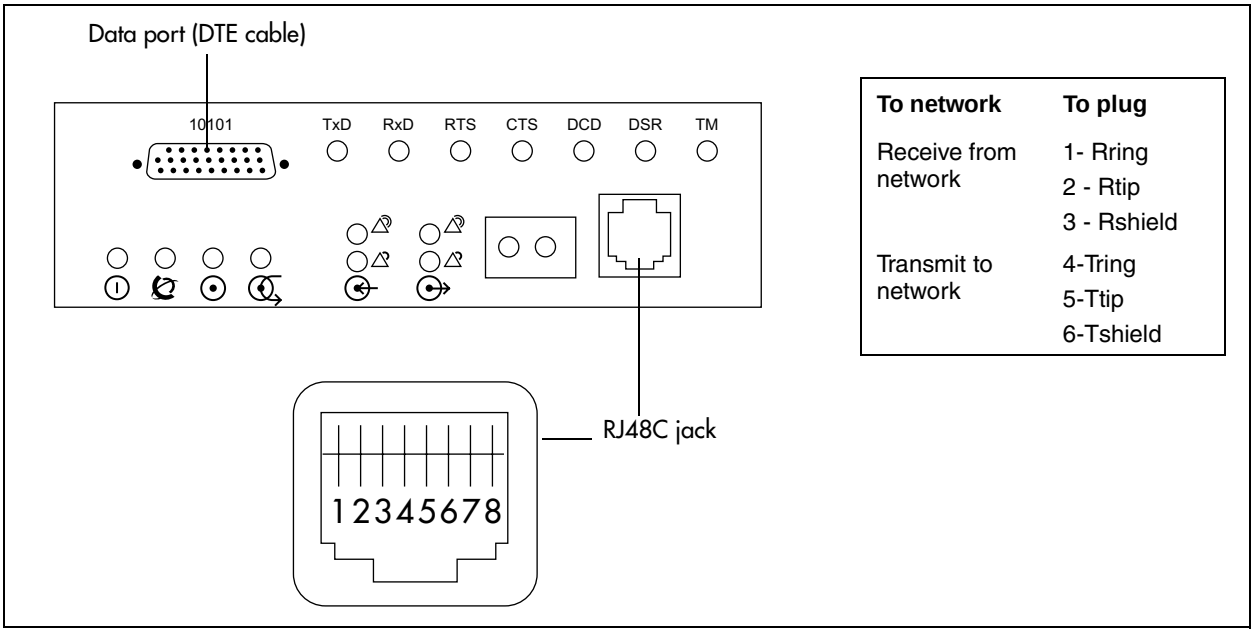
Connecting the DDI MUX

After you have installed the DDI MUX, you can begin connecting it.

To connect the DDI MUX:

1. Connect the T1 cable to the RJ48C socket on the DDI MUX.
2. Wire the other end of the T1 cable to the telco demarcation blocks of the building. Figure 6 shows the wiring pinouts for a DDI MUX to connect to a service provider.

Figure 6 DDI MUX connections



3. Connect one end of the DTE cable to the Data Port on the DDI MUX.
4. Connect the other end of the DTE cable to the Business Communications Manager WAN card or an external DTE.

Note: The DDI MUX supports DTE cables up to 15m (50 feet) long. A cable longer than 15m (50 feet) can be used but may not be reliable.

DTE cables

The DTE cable connects the DDI MUX to the DTE (an external router or the Business Communications Manager WAN card). The type of cable you use depends on the DTE and protocol you are using.

This section describes the pin outs of the cables available for the DDI MUX to support the following standard interfaces:

- V.35

Contact your Nortel Networks Distributor to order specific router cables.

V.35 cables

There are four V.35 cables available from Nortel Networks. These cables are ordered separately so you can select the correct cable for you application.

Table 2 V.35 cables

Cable description	NT code	CPC code
Data Interface Cable v.35, M34 Female, DDIM to external router with Winchester connector	NTAB2936	A0781475
Data Interface Cable v.35, DB-44 Male, DDIM to external router	NTAB2940	A0781479
Data Interface Cable v.35, LFH DB-60, DDIM to external router	NTAB2941	A0781480
Data Interface Cable v.35, DB-26 Male, DDIM to BCM WAN interface (internal router)	NTAB9802	A0888656

V.35 interface

The following table describes the pin outs of the data port on the DDI MUX. This port supports the standard V.35 interface.

Table 3 List of the signals and pinouts specified by V.35

DDI MUX Port		V.35 Interface	
Shield GND	1	A	Frame Ground
DTE Signal GND (102a)	7	B	Signal Ground
DCE Signal GND (102b)	23	B	Signal Ground
TxD+ (103)	2	P	Transmit Data A
TxD- (103)	14	S	Transmit Data B
RxD+ (104)	3	R	Receive Data A
RxD- (104)	16	T	Receive Data B
RTS+ (105)	4	C	Request To Send
RTS- (105)	19	NA	No Connect
CTS+ (106)	5	D	Ready for sending
CTS- (106)	13	NA	No Connect
DSR+ (107)	6	E	Data Set Ready
DSR- (107)	22	NA	No Connect
DTR+ (108)	20	H	Data Terminal Ready
DTR- (108)	26	NA	No Connect
DCD+ (109)	8	F	Data Channel Received Line Signal Detector
DCD- (109)	10	NA	No Connect
TxClk+ (113)	24	U	DTE Transmitter Signal Element Timing A
TxClk- (113)	11	W	DTE Transmitter Signal Element Timing B
TxSync+ (114)	15	Y	DCE Transmitter Signal Element Timing A
TxSync- (114)	12	AA	DCE Transmitter Signal Element Timing B
RxClk+ (115)	17	V	DCE Receiver Signal Element Timing A
RxClk- (115)	9	X	DCE Receiver Signal Element Timing B
RLPBK (140)	21	N	Loopback/Maintenance test
LLPBK (141)	18	L, K[1]	Local Loopback
TM (142)	25	NN	Test Indicator

1 The K pin is connected with LLPBK for compatibility with Cisco equipment.

Configuring the DDI MUX

After you have installed the DDI MUX, you need to configure the DDI MUX settings. You can change these settings using Unified Manager. For general instructions on how to use Unified Manager, refer to the *Business Communications Manager Programming Operations Guide*.

To configure the DDI MUX, you need to:

- assign the DDI MUX modules
- assign the lines for voice traffic
- assign lines to the Data Module of the DDI MUX
- configure the DDI MUX to work with the DTE

Before you start, make sure you record the settings for the DDI MUX in the Programming Record at the back of this guide.

Assigning the DDI MUX modules

1. Start a Unified Manager session.
   For information about how to start and use Unified Manager, refer to the *Business Communications Manager Programming Operations Guide*.
2. Click the **Resources** key and then the **Media Bay Modules** key.
3. Click the heading of the Bus number you assigned to the DDI MUX.
   The Bus number is the same as the DS30 channel number you assigned to the DDI MUX using the DIP switches on the module.
4. Make sure the option in the **Programmed Bus Type** drop list is **Trunk module**.
5. Click the heading of the next Bus number.
   This Bus number is the DS30 channel automatically assigned to the Data Module portion of the DDI MUX.
6. Click the **Programmed Bus Type** drop list and then click **Data module**.

Assigning lines for voice traffic

A digital T1 line has up to 24 telephone lines available for use. With the DDI MUX, you can assign some of these lines to telephony traffic and some to data traffic.

For the lines that you want to use for telephony traffic, configure the lines in the same manner as you configure lines for a DTM. For information about how to configure digital lines on a DTM, refer to the *Business Communications Manager Programming Operations Guide*.

Assigning lines to the data module

The number of lines you assign to the data module determines the bandwidth of your data networking connection. Table 4 shows the allocated bandwidth for the DDI MUX according to the number of lines assigned. The allocated bandwidth also depends on the line data rate indicated by the B channel data rate parameter.

To assign a line to the data module, you must change the line type to Fixed Data Channel and then assign the line to the data module. To assign a line to the data module:

1. Start a Unified Manager session.
   For information about how to start and use Unified Manager, refer to the *Business Communications Manager Programming Operations Guide*.
2. Click the **Services** key and then the **Telephony Services** key.
3. Click the **Lines** key and then click the **Physical lines** key.
4. Click the **All physical lines** key.
5. Click the key of one of the line numbers you want to assign to the Data Module.

   Note: All lines assigned to the DDI MUX must be on the T1 interface connected to the DDI MUX.

6. Click the **Trunk/line data** heading.
7. Click the **Trunk type** drop list and then click **Fixed data channel**.
8. Repeat steps 5 to 7 for each line you want to assign to the Data Module.
9. Click the **Resources** key and then the **Media Bay Modules** key.
10. Click the key of the Bus number assigned to the Data Module.
11. Click the **Data module** key and then the **Fixed line assignment** heading.
12. Click the **Add** button.
    The Add Fixed line assignment dialog box appears.
13. In the **Line** box, enter the line number of one of the lines you want to assign to the Data Module.

    Note: You can assign up to 24 lines to the DDI MUX.

    You cannot assign any lines to the DDI MUX except Fixed lines.

14. Click the **Save** button.
15. Repeat steps 12 to 14 for each line you want to assign to the Data Module.

Table 4 List of all the multiples of 56000 and 64000 bits/s

Number of lines selected	56000 bits/s	64000 bits/s
1	56000	64000
2	112000	128000
3	168000	192000
4	224000	256000
5	280000	320000
6	336000	384000
7	392000	448000
8	448000	512000
9	504000	576000
10	560000	640000
11	616000	704000
12	672000	768000
13	728000	832000
14	784000	896000
15	840000	960000
16	896000	1024000
17	952000	1088000
18	1008000	1152000
19	1064000	1216000
20	1120000	1280000
21	1176000	1344000
22	1232000	1408000
23	1288000	1472000
24	1344000	1536000

Removing a line assignment

If you decide you want to remove a line assignment from the Data Module and use it as a telephony line, use the procedure below:

1. Start a Unified Manager session.
   For information about how to start and use Unified Manager, refer to the *Business Communications Manager Programming Operations Guide*.
2. Click the **Resources** key and then the **Media Bay Modules** key.
3. Click the key of the Bus number assigned to the Data Module.
4. Click the **Data module** key and then click the **Fixed line assignment** heading.
5. Click on the line number you want to remove.
6. Click the **Delete** button.
   A confirmation dialog box appears.
7. Click the **Yes** button.
8. Click the **Services** key and then the **Telephony Services** key.
9. Click the **Lines** key and then click the **Physical lines** key.
10. Click the **All physical lines** key.
11. Click the key of the line number you want to assign to telephony use.
12. Click the **Trunk/line data** heading.
13. Click the **Trunk type** drop list and then click on the correct type of trunk.

    After you have removed the line assignment from the Data Module, you need to configure the line for telephony purposes. For instructions on configuring lines, refer to the *Business Communications Manager Programming Operations Guide*.

Configuring the DDI MUX to work with the DTE

After you have assigned the lines to the data module, you need to configure the DDI MUX so it can work with the DTE.

1. Start a Unified Manager session.
2. Click the **Resources** key and then the **Media Bay Modules** key.
3. Click the key of the Bus number for the Data Module portion of the DDI MUX.
4. Click the **Data Module** key and then click the **Configuration** heading.
5. Configure the setting to match the DTE you are connecting to the DDI MUX.
   Table 5 describes the Data Module configuration settings.

Table 5 DDI MUX Configuration settings

Setting	Description
Protocol	The DDI MUX supports a V.35 interface standard through its data interface port. You can select V.35.
B channel data rate	Select the transmission rate per channel (Fixed data lines) assigned to the DDI MUX. You can select an option: **64k** or 56k.
Transmit clock source	The DDI MUX requires a timing signal to clock data transmitted by the DTE. This signal can be supplied by the DTE or generated internally by the DDI MUX. If the signal is generated by the DTE, the clock must be locked to the frequency of the DDI MUX clock. You can select: **Auto**, DTE, or DCE. • **Auto**: The DDI MUX checks if the clock provided by the DTE is valid. If the clock is valid, the DDI MUX uses DTE clocking. If the DTE clocking is not valid, the DDI MUX uses its own internal clock (DCE). • **DCE**: The internal TxSync clock is used to clock data. • **DTE**: The TXClk clock provided by the DTE is used by the DDI MUX to clock data. **Note**: Use the DTE option only for diagnostic purposes. For all options, the DTE must synchronize to the DDI MUX.
Transmit clock inversion	When the internal DCE signal is used to clock in data, signal delays caused by cable length can cause clocking errors. To adjust for round trip delays between the DDI MUX and DTE, invert the internal clock used by the DDI MUX to clock in data from the DTE. To enable clock inversion, select the **DTE** clock or **Auto** clock. You can select: **Off** or On.
Data inversion	When Data Inversion is on, the DDI MUX inverts the data before routing it to the T1 connection and DTE. Inversion allows the DDI MUX to use the properties of protocols such as HDLC/SDLC (a transmission standard for data) to meet the ones density requirement of the network. This feature must be available and activated at the far end. You can select: **Off** or On.

Testing the DDI MUX

Use loopback tests to check the DDI MUX data transfer capabilities. For loopback tests you must generate a test pattern or data traffic and provide a means to monitor the data path. The DDI MUX provides 2 loopback tests. They are:

- DTE Loopback
- DS30 Loopback

The following applies:

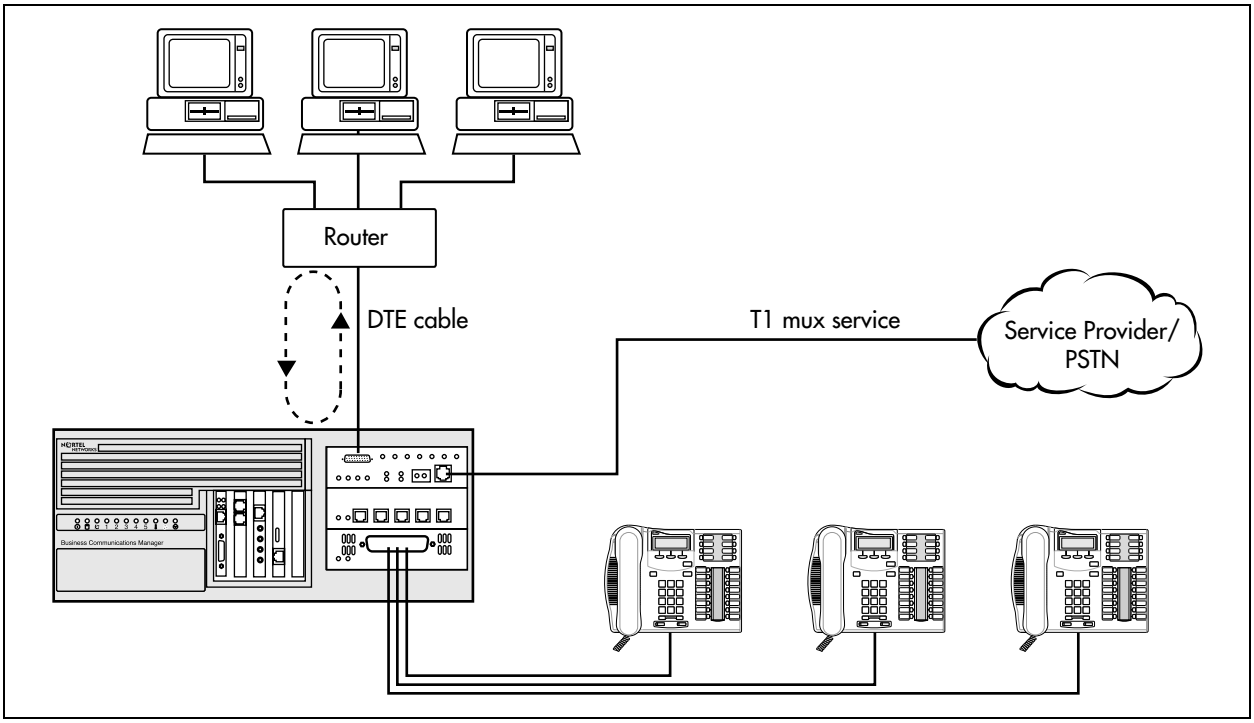
- activate one loopback at a time
- activation of a DTE loopback can be manual or automatic
- manual control over loopback state has priority over automatic
- manual capability of releasing all loopbacks

DTE Loopback test

The DTE Loopback test forwards data transmitted by the DTE (TxD) and loops the data back to the DTE (RxD). DTE Loopback test establishes a data path from the DTE through the internal DDI MUX circuit and back to the DTE. Refer to Figure 7.

You must transmit a test pattern and monitor the received data at the DDI MUX data port. You can use a Bit Error Rate Tester to generate and monitor data traffic.

Figure 7 DTE Loopback Test



To begin a DTE Loopback test:

1. Start a Unified Manager session.
2. Click the **Resources** key and then the **Media Bay Modules** key.
3. Click the key of the Bus number assigned to the Data Module.
4. Click the **Data Module** key and then click the **Loopback status** heading.
5. Click the **Loopback** drop list and then click **Manual DTE** or **Automatic DTE**.

   If you choose **Manual DTE**, the DDI MUX enters loopback mode with the DTE. The DDI MUX takes any data it receives from the DTE loops it back to the DTE.

   If you choose **Automatic DTE**, the DDI MUX enters the DTE loopback state when requested by the DTE. Use Automatic DTE only if this feature is supported by the DTE.
6. Exit the Unified Manager session.
   The TM LED lights to indicate the Loopback test has started.

7 View the TxD and RxD LEDs to make sure data is transmitted and received by the DTE. Refer to "LED Indicator and Diagnostics" on page 32 for information about the LEDs.

8 When you are finished the loopback test, start a Unified Manager session.

9 Click the **Resources** key and then the **Media Bay Modules** key.

10 Click the key of the Bus number assigned to the Data Module.

11 Click the **Data Module** key and then click the **Loopback status** heading.

12 Click the **Loopback** drop list and then click **Off**.

DS30 Loopback test

The DS30 Loopback test forwards data transmitted to the DTE (RxD) back to the MSC in the Business Communications Manager. The DS30 Loopback establishes a data path from the MSC through internal DS256 bus and the internal DDI MUX circuit and back to the MSC.

You must generate a test pattern and provide a means to monitor the data path at the network connection. You can use a T1 Tester to generate and monitor data traffic. Connect the T1 Tester to the RJ48C connector on the DDI MUX.

In a system where a T1 connects to a CSU/DSUs, the far end CSU/DSU can generate and monitor the network traffic while the local DDI MUX is in DS30 loopback tests.

To begin a DS30 Loopback test:

1 Start a Unified Manager session.

2 Click the **Resources** key and then the **Media Bay Modules** key.

3 Click the key of the Bus number assigned to the Data Module.

4 Click the **Data Module** key and then click the **Loopback status** heading.

5 Click the **Loopback** drop list and then click **Manual DS30**.
If you choose **Manual DS30**, the DDI MUX enters loopback mode with the MSC. The DDI MUX takes any data it receives from the MSC loops it back to the MSC.

6 Exit from the Unified Manager session.
The TM LED lights to indicate the Loopback test has started.

7 View the TxD and RxD LEDs to make sure data is transmitted and received by the MSC. Refer to "LED Indicator and Diagnostics" on page 32 for information about the LEDs.

8 When you are finished the loopback test, start a Unified Manager session.

9 Click the **Resources** key and then the **Media Bay Modules** key.

10 Click the key of the Bus number assigned to the Data Module.

11 Click the **Data Module** key and then click the **Loopback status** heading.

12 Click the **Loopback** drop list and then click **Off**.

Troubleshooting

These troubleshooting procedures help you to solve problems with network connections and cables. Read these troubleshooting tips before replacing any components.

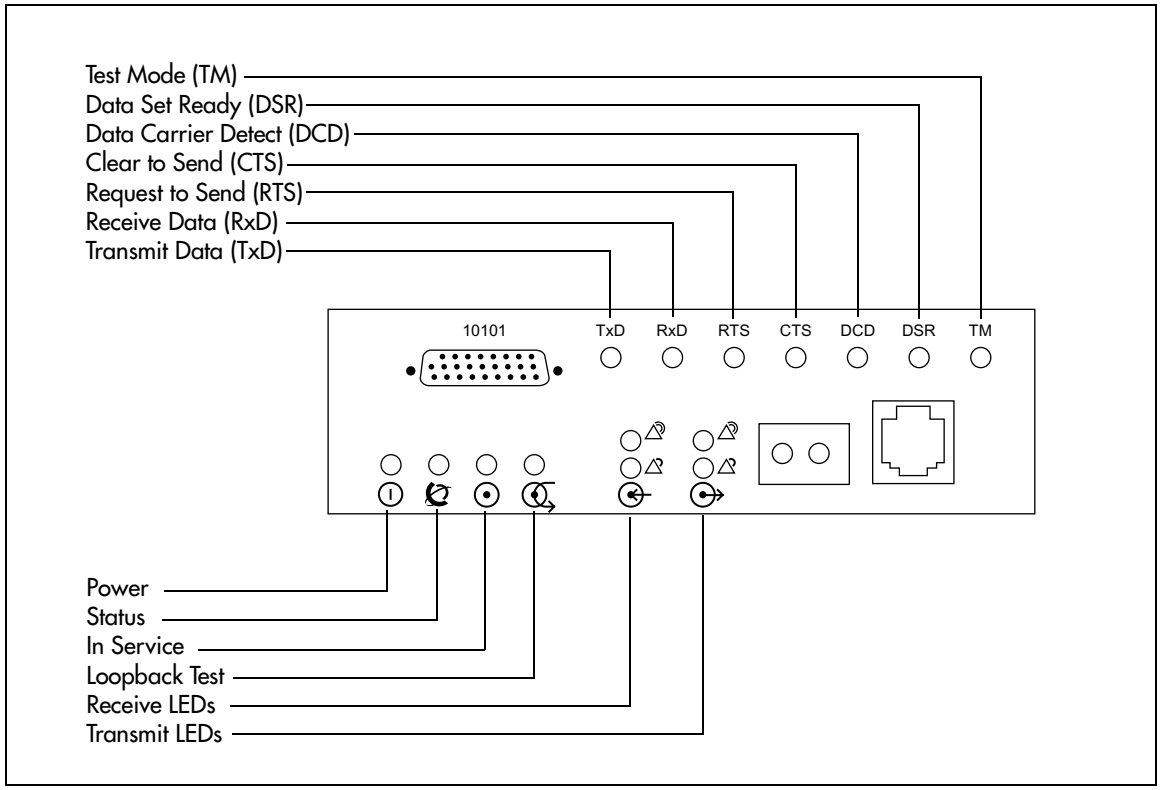
Before you begin troubleshooting, gather all the information that is relevant to your network configuration:

- the DDI MUX Programming Record
- records from persons who use the network
- information about other hardware such as routers, within the public or private network

LED Indicator and Diagnostics

The DDI MUX has 15 LEDs to check or monitor its status.

Figure 8 DDI MUX LEDs



The LEDs light under the following conditions:

Table 6 DDI MUX LEDs

LED	**Description**
TxD (Transmit data)	The LED flashes at a rate equal to the number of zeros in the data received from the DTE and transmitted over the network. The speed of the flashes is an indication of the speed of the data sent over the network.
RxD (Receive data)	The LED flashes at a rate equal to the number of zeros in the data received from the network and transmitted to the DTE. The speed of the flashes is an indication of the speed of the data sent over the network.
RTS (Request to Send)	The LED lights when the DTE requests permission from the DDI MUX to send data.
CTS (Clear to Send)	The LED lights when the DDI MUX is signaling the DTE that it has permission to send data.
DCD (Data Carrier Detect)	The LED lights when the Business Communications Manager is receiving a carrier signal.
DSR (Data Set Ready)	The LED lights when the DDI MUX is ready to communicate.
TM (Test Mode)	The LED lights when the DDI MUX is signaling to the DTE that it detects a test condition.
(Power)	On indicates that the DTM is receiving +5 volts.
(Status)	On indicates there is data communication between the DDI MUX and the MSC card.
In Service	Flashing indicates that the T1 trunks are out of service because a loopback test is running or the DDI MUX is initializing.
Loopback	On indicates a continuity loopback test is running on the T1 link.
Receive Alarm	On indicates a problem with the received digital transmission on the T1 link. This half-duplex link does not work.
Receive Error	On indicates a small error as a result of degraded digital transmission on the T1 link. Possible causes are an ohmic connection, water ingress, or too long a loop.
Transmit Alarm	On indicates the DDI MUX cannot transmit on the T1 link. The DDI MUX sends an Alarm indication signal (AIS) to the terminating switch. This half-duplex link does not work.
Transmit Error	On indicates the DDI MUX is sending a remote alarm indication (RAI) carrier failure alarm (CFA) to the terminating switch. If the Transmit Alarm is not on, this error indicates a far-end or cable problem.

Installation troubleshooting

The Business Communications Manager media bay modules are working when both the ⏻ (Power) and (Status) LEDs on the modules are on solid.

- If the ⏻ (Power) LED does not light, refer to "Shutting down the system" on page 19. After the Business Communications Manager is correctly shut down, remove the module and check the connectors at the back of the module for dirt or loose connections.

  After you reinstall the module, if the LED still does not light, install a different module into that bay to check for a possible fault in the backplate. If the second module works, assume that the first module is defective and replace it with a new module.
- If the ⏻ (Power) LED lights, but the (Status) light does not light, or continues to blink, wait 10 minutes to allow for information download. If the light continues to blink, power down the system and check the DIP switch settings on the module. This might also indicate a loose cable at the back of the media bay module housing.
- If the LEDs are on solid, but the module cannot communicate or be communicated with, check the Unified Manager settings for the module.
- If all of the LEDs are flashing continuously, the DDI MUX is initializing.

Problems with equipment

Before continuing, make sure that you have followed the procedures for installing the DDI MUX.

DCD LED is not solid and DSR LED is solid.

There is no network connection. Check the status of the network connection (T1 connection).

The transmit data and/or the receive data LED is not blinking and DSR, RTS and CTS LEDs are on.

Data not sent over the network.

- Check the DTE configuration.
- Check the connection between the DTE and the DDI MUX.
- Check that you set the type setting for the data module to DDI MUX.
- Check that the interface standard is the same for the DDI MUX and DTE and that you use the appropriate cable.
- Invert the clock.

All data not received at the far end.

Problem indicates invalid clocking between the DDI MUX and the DTE.

- Check if TxD and RxD LEDs are blinking.
- Check the DTE configuration.
- Check the DDI MUX clock source using Unified Manager.
- Check data inversion configuration at the far end.
- Make sure the network supports the data rate per channel.
- Make sure data rate per channel and channels assigned are equal to the far end.
- Invert the clock.

DCE, DSR and CTS LEDs are off

- Check configuration of the DDI MUX.
- Check the T1 cable.

Power, Status and CTS LEDs are on solid and In Service, Loopback Test, Receive and Transmit LEDs are blinking

Check the DS30 channel assigned to the DDI MUX and the DS30 Split used by the Business Communications Manager system.

- If the Business Communications Manager system uses a 2/6 DS30 Split, the DDI MUX must be assigned to a DS30 channel from 2 to 6.
  If the Business Communications Manager system uses a 3/5 DS30 Split, the DDI MUX must be assigned to a DS30 channel from 2 to 5.
- Make sure there is no other media bay module using the DS30 channel assigned to the DDI MUX or the next DS30 channel. For example, if the dip switch settings on the DDI MUX are set to DS30 channel 3, no other media bay module can use DS30 channels 3 or 4.

For more information about the DS30 Split, refer to the *Business Communications Manager Programming Operations Guide*.

TM is on, data is not transmitting

- Loopback is active. Program Loopback to None.

Alarm 101 sounds

There is a mismatch of type of hardware connected to the Business Communications Manager and type of hardware defined in programming.

- Check that the Programmed Bus Type setting is Data Module.

Programming Record

Complete the following **DDI MUX Programming Record** before you start programming.

DDI MUX Programming Record		
Work Site: _____		
Address: _____	Telephone Number: _____	
_____	Installation Date: _____	
_____	Installer: _____	
Notes: _____		
Configuration parameters		
Protocol	**V.35** ❑	
Fixed Access		
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
	Line ____ Channel ____	Line ____ Channel ____
Loopback State		
	Off ❑ Manual DTE ❑ Manual DS30 ❑ Automatic DTE ❑	